

# Webinar

Driving the future of CAN:  
EMC compliant automotive  
3.3V CAN transceivers

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# Agenda

- Introduction
- Why 3.3V CAN?
- Simplifying CAN design
- Interoperability with 5V CAN and 3.3V CAN
- The industry's first automotive EMC compliant 3.3V CAN transceivers
- EMC Compliance
- Getting started with TI's new 3.3V automotive CAN

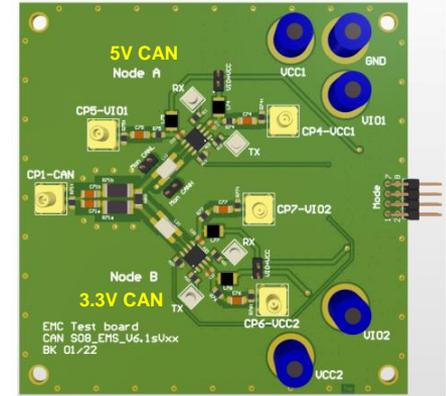
# Introduction

- Vehicles are evolving to include more advanced features enhancing safety, comfort and convenience while also emphasizing power efficiency.
- Power efficiency enables longer driving ranges for electric vehicles (EV) and lowers operational costs.
- Semiconductor manufacturers are lowering the typical supply voltage of an electrical components, such as a microcontroller (MCU), from 5V to 3.3V.



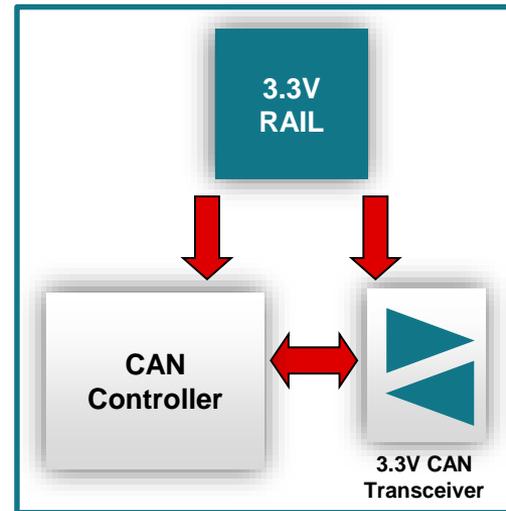
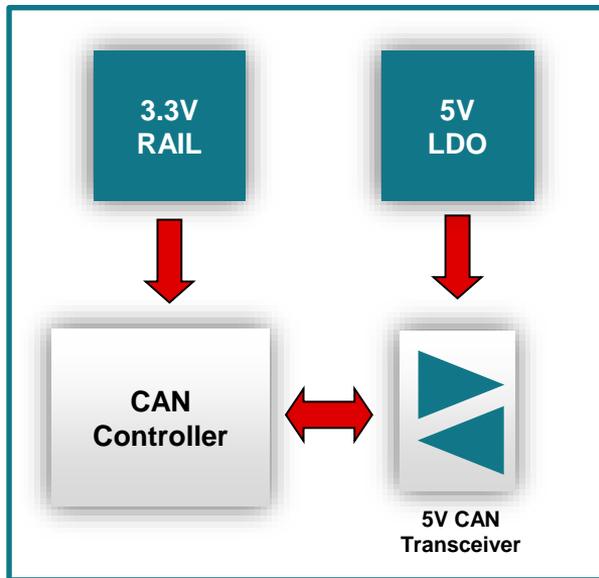
# Why 3.3V CAN?

- **Simplify power design**
  - In many automotive systems a 5V power rail is only needed for the 5V CAN transceiver while all other components can use a 3.3V or lower supply rail derived from the battery
- **Save cost and space**
  - CAN transceivers operating from the 3.3V power supply eliminates the need for the 5V rail, saving board space and BOM cost.
- **Interoperability with 5V CAN on same bus**
  - CAN being differential interface works with 3.3V and 5V CAN transceivers on the same bus, since the minimum output differential voltage and receiver thresholds remain the same.
- **EMC compliance in homogeneous and heterogeneous networks**



Conclusion of test results:	Single test	Result
according to IEC62228-3, Annex C: limit class III	Emission RF disturbances	Pass
	Immunity RF disturbances	Pass
	Immunity Transients	Pass
	Immunity ESD	Pass

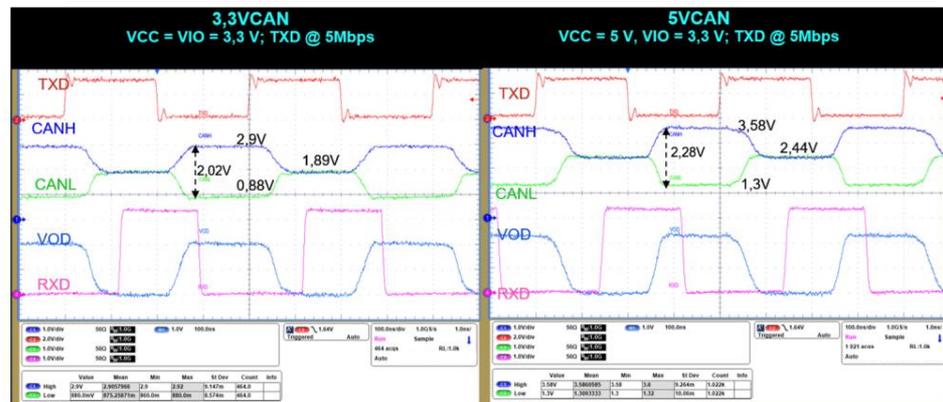
# Simplifying CAN design



# Interoperability with 5V CAN and 3.3V CAN

- ISO 11898-2:2024 requires a common-mode voltage range of  $-12\text{V}$  to  $+12\text{V}$ 
  - TCAN340x-Q1 recessive biasing of CAN high (CANH) and CAN low (CANL) terminals is  $1.89\text{V}$
  - Standard 5V CAN transceivers recessive biasing of CAN high (CANH) and CAN low (CANL) terminals is  $2.44\text{V}$
- ISO 11898-2:2024 requires  $V_{OD}$  of  $1.5\text{V}$  for transmitter and  $V_{ID}$  of  $0.9\text{V}$  for the receiver
  - 3.3V devices are above these requirements and allow seamless communication with any other ISO 11898-2 compliant transceivers
- TCAN340x-Q1 is fully interoperable with other transceivers on the same bus powered by a  $5\text{V}$  supply

## Waveform comparison of 5V CAN and 3.3V CAN transceiver



# TCAN340x-Q1

## 3.3V automotive CAN FD transceivers with +/-58V bus fault, +/-30V<sub>cm</sub>

### Features

- ISO 11898-2:2016 compatible
- Supports both classic CAN and CAN FD up to 8Mbps
- Common mode range:  $\pm 30V$
- Remote wake-up over CAN support (WUP)
- I/O level shifting: 1.7V to 3.6V
- Protection features:
  - $\pm 58V$  bus-fault protection
  - $\pm 10kV$  HBM ESD protection
  - $\pm 8kV$  contact IEC61000-4-2 ESD
  - Undervoltage protection
  - Thermal shutdown protection
  - TXD dominant state timeout
- Junction temperature range:  $-40^{\circ}C$  to  $+150^{\circ}C$
- Available in 8 pin SOIC, VSON and SOT23 (2.9 mm x 1.6 mm) packages

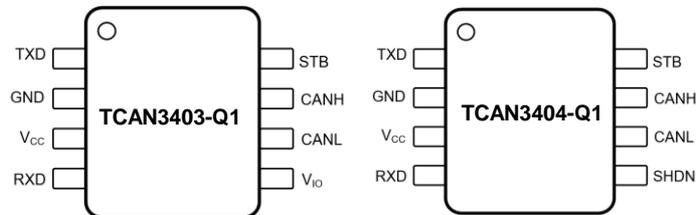
### Applications

- [Body electronics](#)
- [Advanced driver assistance systems \(ADAS\)](#)
- [Hybrid electric & powertrain systems](#)
- [Zone architecture](#)
- [Infotainment](#)
- [Industrial transport \(non-car & non-light truck\)](#)

### Benefits

- 3.3V CAN requires less power and excellent for low power applications while monitoring the bus
- EMC performance yields high reliability in harsh environments
- Wide temperature range to accommodate harsh environments
- Small footprint 8pin SOT package saves >70% PCB space over SOIC-8
- Wide I/O voltage level enables the device to address future applications where MCU I/O goes down to 1.8V

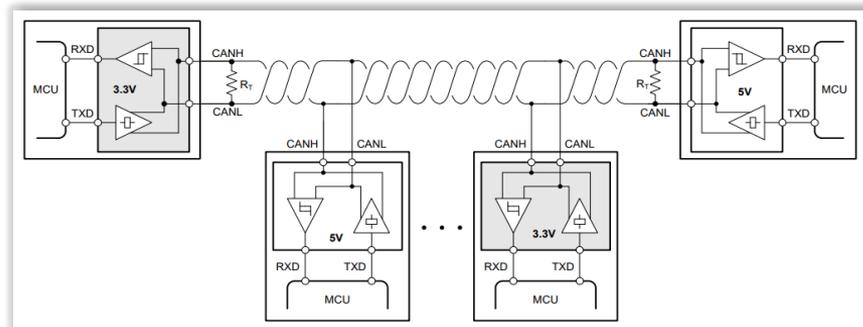
Device	Pin 5	Description
TCAN3403-Q1	V <sub>IO</sub>	I/O shift voltage and standby mode
TCAN3404-Q1	SHDN	Shutdown and standby modes



# EMC compliance

- Meeting component-level EMC testing is a strict requirement to get CAN transceivers qualified at major car makers
  - IEC62228-3:2019 is one standard used to test and qualify CAN transceivers for conducted emissions and conducted immunity (EMC)
- Proprietary design techniques implemented in both 3.3V and 5V devices maintain EMC compliance per IEC 62228-3
  - TCAN3404-Q1 and TCAN3403-Q pass EMC requirements in homogenous or heterogeneous networks

Conclusion of test results:	Single test	Result
according to IEC62228-3, Annex C: limit class III	Emission RF disturbances	Pass
	Immunity RF disturbances	Pass
	Immunity Transients	Pass
	Immunity ESD	Pass



# Getting started with TI's new 3.3V automotive CAN

You can start evaluating this device leveraging the following:

Content type	Content title	Link to content or more details
Product folder	Automotive 3.3V CAN flexible-data-rate (FD) transceiver with flexible I/O and standby mode	<a href="https://www.ti.com/product/TCAN3403-Q1">https://www.ti.com/product/TCAN3403-Q1</a>
Product folder	Automotive 3.3V CAN flexible-data-rate (FD) transceiver with shutdown and standby mode	<a href="https://www.ti.com/product/TCAN3404-Q1">https://www.ti.com/product/TCAN3404-Q1</a>
Technical article	Simplify automotive interface design with fully interoperable and EMC-compliant 3.3V CAN transceivers	<a href="https://www.ti.com/lit/ta/ssztd46/ssztd46.pdf">https://www.ti.com/lit/ta/ssztd46/ssztd46.pdf</a>
White paper	How automotive-qualified electromagnetic-compliant 3.3V CAN FD transceivers improve ECU performance	<a href="https://www.ti.com/lit/wp/slla636a/slla636a.pdf">https://www.ti.com/lit/wp/slla636a/slla636a.pdf</a>
Development tool or evaluation kit	Universal 8-pin SOIC CAN evaluation module	<a href="https://www.ti.com/tool/TCAN-SOIC8-EVM">https://www.ti.com/tool/TCAN-SOIC8-EVM</a>

Learn more at [TI.com/CAN](https://www.ti.com/CAN)



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